WHAT IS CLAIMED IS:

1. A composite piezoelectric transducer comprising:

a plurality of arranged piezoelectric elements; and

dielectric portions positioned between the plurality of piezoelectric elements,

wherein an area of a cross-section perpendicular to an ultrasonic emitting direction in at least one piezoelectric element of the plurality of piezoelectric elements varies along the ultrasonic emitting direction.

2. The composite piezoelectric transducer of claim 1, wherein the at least one piezoelectric element has a resonance frequency which is different from resonance frequencies of the other piezoelectric elements.

3. The composite piezoelectric transducer of claim 1, wherein the resonance frequencies of the plurality of piezoelectric elements have a distribution in which a difference between the minimum value and the maximum value is equal to or more than 10 % of a mean value.

4. The composite piezoelectric transducer of claim 1, wherein each of the plurality of piezoelectric elements has a size in a certain direction perpendicular to the ultrasonic emitting direction, the size being fixed along the ultrasonic emitting direction.

5. The composite piezoelectric transducer of claim 3, wherein each of the plurality of piezoelectric elements has a uniform thickness along the ultrasonic emitting direction.

6. The composite piezoelectric transducer of claim 1, wherein the plurality of piezoelectric elements are two-dimensionally arranged along a plane perpendicular to the ultrasonic emitting direction of the piezoelectric elements, and

resonance frequencies of the plurality of piezoelectric elements are varied depending on the positions thereof in the plane.

7. The composite piezoelectric transducer of claim 1, wherein the plurality of piezoelectric elements have a substantially uniform height.

8. The composite piezoelectric transducer of claim 1, wherein resonance frequencies of the piezoelectric elements in a peripheral portion of a plane perpendicular to the ultrasonic emitting direction of the piezoelectric elements are lower than resonance frequencies of the piezoelectric elements in a center portion of the plane.

9. The composite piezoelectric transducer of claim 1, wherein an area of a cross-section perpendicular to an ultrasonic emitting direction of at least one of the plurality of piezoelectric elements in an end face of the piezo-

electric element is larger than the area in a center of the piezoelectric element.

10. The composite piezoelectric transducer of claim 1, wherein an area of a cross-section perpendicular to an ultrasonic emitting direction of at least one of the plurality of piezoelectric elements in an end face of the piezoelectric element is smaller than the area in a center of the piezoelectric element.

11. The composite piezoelectric transducer of claim 1, wherein each of the plurality of piezoelectric elements has a pair of columnar portions extending in the ultrasonic emitting direction, and a thickness of a bridging portion for coupling the columnar portions in the middle thereof is varied in a plane perpendicular to the ultrasonic emitting direction of the piezoelectric elements.

12. The composite piezoelectric transducer of claim 1, wherein each of the plurality of piezoelectric elements has an opening portion in the center thereof, and a size of the opening portion is varied in a plane perpendicular to the ultrasonic emitting direction of the piezoelectric elements.

13. The composite piezoelectric transducer of claim 1, wherein shapes of the plurality of piezoelectric elements are selected so that resonance fre-

quencies of the plurality of piezoelectric elements have a predetermined distribution in plane.

14. The composite piezoelectric transducer of claim 1, wherein a ratio of a size in the ultrasonic emitting direction of the piezoelectric element to the minimum size S of a cross-section perpendicular to the ultrasonic emitting direction of the piezoelectric element is 5 or more.

15. The composite piezoelectric transducer of claim 1, wherein the dielectric portion is formed from a resin.

16. The composite piezoelectric transducer of claim 15, wherein a modulus of elasticity of the resin has a predetermined distribution in accordance with positions of the piezoelectric elements in a plane perpendicular to the ultrasonic emitting direction.

17. A unit composite sheet including a resin layer and a plurality of piezoelectric elements arranged on the resin layer, wherein

the plurality of piezoelectric elements have different shapes depending on the positions thereof on the resin layer.

18. A layered structure of composite sheets, wherein a plurality of unit composite sheets each including a resin layer and a plurality of piezoelec-

tric elements arranged on the resin layer are layered, the piezoelectric elements are sandwiched by the resin layers, thereby fixing the dispositional relationship, and the plurality of piezoelectric elements included in each of the unit composite sheets have different shapes depending on the positions thereof on the resin layer.

19. A composite piezoelectric transducer fabricated by cutting a layered structure of composite sheets in which a plurality of unit composite sheets each including a resin layer and a plurality of piezoelectric elements arranged on the resin layer are layered, the piezoelectric elements are sandwiched by the resin layers, thereby fixing the dispositional relationship, and the plurality of piezoelectric elements included in each of the unit composite sheets have different shapes depending on the positions thereof on the resin layer, the cutting being performed across an ultrasonic emitting direction of the piezoelectric elements.

20. The composite piezoelectric transducer of claim 19, wherein the piezoelectric elements are surrounded by a resin.

21. The composite piezoelectric transducer of claim 20, wherein the resin is part of the resin layer of the unit composite sheet which flows and hardens.

22. An ultrasonic probe comprising:

a composite piezoelectric transducer including a plurality of arranged piezoelectric elements and dielectric portions positioned between the plurality of piezoelectric elements, an area of a cross-section perpendicular to an ultrasonic emitting direction in at least one of the plurality of piezoelectric elements being varied along the ultrasonic emitting direction; and

a pair of electrodes formed on the composite piezoelectric transducer.

23. The ultrasonic probe of claim 22, wherein a matching layer is formed on the composite piezoelectric transducer, and

a thickness of the matching layer is varied along a direction in which resonance frequencies of the piezoelectric elements in the composite piezoelectric transducer are varied.

24. An ultrasonic examination device comprising an ultrasonic probe, a transmitting section for transmitting a signal to the ultrasonic probe, and a receiving portion for receiving an electric signal output from the ultrasonic probe, wherein the ultrasonic probe includes:

a composite piezoelectric transducer including a plurality of arranged piezoelectric elements and dielectric portions positioned between the plurality of piezoelectric elements, an area of a cross-section perpendicular to an ultrasonic emitting direction in at least one of the plurality of piezoelectric elements being varied along the ultrasonic emitting direction; and

a pair of electrodes formed on the composite piezoelectric transducer.

25. A method of producing a unit composite sheet comprising the steps of:

(a) providing a composite plate in which a resin layer is formed on one surface of a plate-like piezoelectric element; and

(b) forming a plurality of piezoelectric elements from the plate-like piezoelectric element by forming a plurality of grooves in the plate-like piezoelectric element of the composite plate without completely dividing the resin layer, wherein

the step (b) applies different shapes to the plurality of piezoelectric elements depending on the positions thereof on the resin layer.

26. A method of producing a unit composite sheet comprising the steps of:

(c) temporarily fixing a plate-like piezoelectric element on a substrate by means of an adhesive sheet;

(d) forming a plurality of columnar piezoelectric elements from the plate-like piezoelectric element by forming a plurality of grooves in the plate-like piezoelectric element; and

(e) transferring the plurality of columnar piezoelectric elements temporarily fixed on the substrate onto a resin layer, wherein

the step (b) applies different shapes to the plurality of piezoelectric elements depending on the positions thereof on the resin layer.

27. The method of claim 26, wherein the plurality of grooves are formed by sand blasting.

28. A method of producing a composite piezoelectric transducer comprising the steps of:

(f) providing a plurality of unit composite sheets each including a resin layer and a plurality of piezoelectric elements arranged on the resin layer, the plurality of piezoelectric elements having different shapes depending on the positions thereof on the resin layer;

(g) layering the plurality of unit composite sheets; and

(h) integrating the plurality of layered unit composite sheets.

29. The method of claim 28, further comprising a step of cutting the integrated unit composite sheets across the piezoelectric elements.